REMARKS

In the Title of the Invention

The Title of the Invention has been amended so that it includes the proper acronym "QKD."

In the Abstract of the Invention

The Abstract has been amended to spell out the acronym QKD and to correct a typographical error.

In the Specification

Paragraphs [0003], [0005], [0018], [0082], [0083], [0086], [0087], [0102] and [0107] have been amended to correct typographical errors.

Paragraphs [0023] and [0025] have been amended to spell out the first occurrence of the acronyms FPGA and RNG, respectively.

Paragraph [0116] has been amended so that the optical clock period as indicated in FIG. 4 is properly referenced.

In the Claims

Claims 1-18 are pending in the Application. Claims 1, 2 10, 12-15 and 17 stand rejected under 35 USC §102(b), while claims 3-9, 11, 16, and 18 stand rejected under 35 USC §103(a).

Claims 1-4, 8, 9, 11-13 and 17 have been amended. Claims 2-4, 8, 9, 11 and 17 have been amended to make minor corrections in wording, while claims 1 and 13 have been amended to clarify the distinctions with the cited prior art. In particular, claims 1 and 13 have been amended to denote that first and second laser sources are used, and that the quantum signals are transmitted in a continuous mode.

New claims 19 and 20 depending from independent claim 11 have been added. Claim 19 adds limitations to the optical modems of claim 11 as described in

at least paragraphs [0082]-[0089]. Claim 20 adds limitations to the optical synchronization pulses of claim 11 as described in at least paragraphs [0015]-[0121] and FIG. 4.

I. Claim rejections under 35 USC § 102(b)

Claims 1, 2 10, 12-15 and 17 stand rejected under 35 USC §102(b) as being anticipated by USP 5,675,648 to Townsend ("Townsend '648").

"Anticipated" means that all of the elements and limitations of a given claim are described in a single prior art reference. *See e.g., Akzo N.V. v. U.S. Int'l Trade Comm'n,* 808 F.2d 1471, 1479 (Fed.Cir.1986) ("Under 35 U.S.C. § 102, anticipation requires that each and every element of the claimed invention be disclosed in a prior art reference.")

Review of Townsend '648

Townsend '648 discloses a QKD system that uses a "common transmission medium" (namely, transmission (optical) fibre (3)) for the quantum and public channels. Townsend '648 includes a description of a timing system that employs a system clock to avoid timing errors in transmitting and detecting a weak optical pulse (see col. 6, lines 41-62, and col. 8, lines 6 through 57). The timing function is performed during the calibration of the interferometer.

With reference to FIG. 4 of Townsend '648, the amplified output from the public channel detector is input into a clock registration module. This module contains an electronic filter that produces an oscillating signal at the pulse repetition frequency, which is used to lock a local oscillator to the optical source or master clock frequency. This local oscillator is then used to provide the timing information required by the receiver during the quantum transmission stage of the protocol. Each time the transmitted system is recalibrated via the public channel, the local oscillator is re-timed to avoid the accumulation of any timing errors.

As shown in FIG. 4 and as discussed in col. 6, lines 41-45, the QKD system of Townsend '648 includes a ***single laser*** (48). Also, the transmitter and receiver are

connected only by the aforementioned transmission fiber (3). This means that the only way the transmitter and receiver can share timing information is by interrupting the transmission of "weak" pulses by adjusting the attenuator to insert an occasional "strong" multi-photon pulse, as stated in col. 8, lines 26-32.

In other words, the QKD system of Townsend '648 operates in a one-way ***switched mode*** rather than in a ***continuous mode***.

Applicants' Claimed Invention

Claims 1, 2 and 10

Applicants' claim 1 is a method claim that includes the limitations that the quantum signals be generated by a ***first laser source*** and transmitted in a ***continuous mode,*** where the regular (e.g., periodic) generation of quantum signals remains uninterrupted by other signals—that is to say, there are no "gaps" where a quantum signal is missing because it needed to be replaced by a timing signal. This is made possible through the use of a ***second laser source*** that generates the synchronization ("sync") signals.

In contrast, the QKD system of Townsend '648 uses a ***single laser,*** and as such must operate in a ***switched mode*** where the transmission of quantum signals is interrupted in order to generate a timing (sync) signal.

The Examiner points to column 6, lines 65 – column 7, line 2 of Townsend '648 as teaching that the quantum system can transmit quantum signals in continuous mode by using "wavelength-depending fiber couplers." Applicants respectfully point out that the cited passage refers to continuous transmission of the "clock and calibration" information and not to the continuous transmission of the quantum signals. In addition, the entire teaching of Townsend '648 is directed to the use of a ***single laser***. The cited passage states that (emphasis added) "alternatively different wavelengths ***might*** be used." This mere hint of an idea relating to using two different wavelengths falls far short of a teaching of how one skilled in the art would achieve the ***continuous mode operation*** of the ***quantum signals*** using a ***single laser***.

Applicant's claim 1 also includes the limitations that the quantum signals be transmitted in "frames" and that the sync signals include "frame sync pulses" and "data pulses" (see Applicant's FIG. 4 and paragraph [0116]). ***None of these limitations are disclosed in Townsend '648***.

The Examiner cites column 5, lines 50-53 of Townsend '648 as teaching the above-mentioned claim limitations. However, the cited passage is directed to the use of the public channel to exchange information about how the "signal pulses" (i.e., Applicant's "quantum signals") were encoded. This information is not communicated using "sync signals" for system timing. Rather, this information is communicated in the standard manner used in conventional QKD and is completely unrelated to the timing of the system. In fact, this communication occurs ***after*** the signal pulses are transmitted and detected and so by definition cannot have anything to do with QKD system timing needed during the transmission and detection of the signal pulses.

The calibration of the QKD system using the public channel is described in Townsend '648 in column 5, line 57 through column 6, line 21. However, this section does not relate to ***timing calibration*** but rather describes calibrating either the ***output polarization modulation*** or the ***output phase modulation*** by fixing the modulator settings and making a measurement of the phase or polarization and compensating the system accordingly prior to operating the QKD system. This ***modulation calibration*** process has absolutely nothing to do with Applicants' claimed limitations of sending "sync signals" that include both ***frame sync pulses*** and ***data signals*** to provide ongoing ***timing synchronization*** during QKD system operation.

For at least the above reasons, Townsend '648 cannot reasonably be said to anticipate claim 1 under 35 USC § 102(b). It thus follows that claims 2 and 10 depending therefrom cannot be said to be anticipated under 35 USC § 102(b).

Claim 12

Claim 12 is directed to a timing system for a QKD system having first and second QKD stations. Claim 12 includes the limitations that each QKD station have

an optical modem, "wherein ***each optical modem*** has ***circulator*** coupled to a ***laser-based*** optical transmitter." Townsend '648 teaches a QKD system that includes only ***a single laser*** located in one of the QKD stations.

Claim 12 also includes limitations where one of the optical modems includes first and second phase lock loops (PLLs) coupled to the optical receiver and the optical transmitter located therein, and the other optical modem includes a third PLL coupled to the optical receiver therein, and a clock coupled to the optical transmitter therein.

The Examiner points to column 6, lines 1-5 as teaching the above claim limitations related to the optical modems and the PLLs. However, a closer reading of the cited passage in the context of the larger discussion in which it resides reveals that there is no discussion of the use of phase lock loops or optical modems. Rather, the cited passage relates to a "feedback loop" for a ***polarization compensator*** in the context of the above-described ***modulation calibration*** that seeks to measure the output polarization from the transmission fibre prior to operating the QKD system. This is ***completely unrelated*** to the use of ***PLLs*** in ***optical modems*** for a ***timing system,*** which is what is being claimed in Applicants' claim 12.

For at least these reasons, Townsend '648 cannot be said to anticipate claim 12 under 35 USC § 102(b).

Claim 13-15, 17

Claim 13 is directed to a QKD system and includes essentially the same basic limitations as discussed above in connection with claim 1 – namely, the use of first and second lasers, the exchange of quantum signals in a continuous mode, and the use of synchronization signals that include frame sync pulses and data pulses.

For the same reasons as discussed above in connection with claim 1, these limitations are not present in Townsend, so that Townsend '648 cannot be said to anticipate claim 13 under 35 USC § 102(b). It thus follows that claims 14, 15 and 17 depending from claim 13 are not anticipated under 35 USC § 102(b).

In view of the above, withdrawal of the anticipation rejection of claims 1, 2 10,

12-15 and 17 is earnestly requested.

II. Claim rejections under 35 USC §103

Claims 3-9, 11, 16 and 18 were rejected as being obvious under 35 USC § 103(a).

In particular, claim 3 was rejected under 35 USC §103(a) based on Townsend '648 in view of USP 5,768,378 to Townsend ("Townsend '378"). Claims 4 and 5 were rejected under 35 USC §103(a) based on Townsend '648 in view of USP 5,111,451 to Piasecki et al. ("Piasecki"). Claims 6, 7, 11, and 18 were rejected under 35 USC §103(a) based on Townsend '648 in view of USP 5,307,410 to Bennett ("Bennett"). Claims 8 and 9 were rejected under 35 USC §103(a) based on Townsend '648 in view of USP 6,438,264 to Gisen et al. ("Gisen"). Claims 16 was rejected under 35 USC §103(a) based on Townsend '648 in view of US2002/0181390 A1 to Mody et al. ("Mody").

An obvious rejection under 35 USC §103(a) requires that the combination of cited references yield all of the claim limitations.

Claim 3

Claim 3 depends from claim 1. The obvious rejection of claim 3 is based on the presumption that Townsend '648 discloses all of the claim limitations of claim 1, while Townsend '378 is cited for disclosing the limitations in claim 3. However, for the reasons discussed in detail above, Townsend '648 does not include all of the claim limitations of claim 1.

Consequently, the combination of Townsend '648 and Townsend '378 cannot be said to disclose all of the claim limitations in claim 3, so that an obvious rejection of claim 3 based on the combined Townsend references is inappropriate.

Claims 4 and 5

Claims 4 and 5 ultimately depend from claim 1. The obvious rejection of claims 4 and 5 are based on the presumption that Townsend '648 discloses all of the claim limitations of claim 1, while Piasecki discloses the limitations in claim 4 and Townsend '648 discloses the limitations in claim 5 relating to the first and second optical modems and the PLLs.

However, for the reasons discussed above, Townsend '648 does not include all of the claim limitations of claim 1, and also does not disclose the limitations relating to the optical modems and the PLLs as set forth in claim 5 for the reasons discussed above in connection with claim 12.

Consequently, the combination of Townsend '648 and Piasecki cannot be said to disclose all of the claim limitations in claims 4 and 5, so that an obvious rejection based on the combination is inappropriate.

Claims 6 and 7

Claims 6 and 7 ultimately depend from claim 1. The obvious rejection of claims 6 and 7 are based on the presumption that Townsend '648 discloses all of the claim limitations of claim 1, while Bennett discloses the limitations in claims 6 and 7.

However, for the reasons discussed above, Townsend '648 does not include all of the claim limitations of claim 1.

Consequently, the combination of Townsend '648 and Bennett cannot be said to disclose all of the claim limitations in claims 6 and 7 so that an obvious rejection based on the combination is inappropriate.

Claim 11

In rejecting claim 11, the Examiner cites Townsend '648 FIG. 4 as teaching the following limitations ***for each QKD station***:

d) an optical modem adapted to send and receive optical synchronization signals over a timing channel, the optical modem having an optical receiver and an optical transmitter both coupled to a circulator, which is coupled to the timing channel;

A closer inspection of Townsend '648 reveals that it does not teach any of the above limitations. The QKD system shown in FIG. 4 includes a ***single laser*** in the ***transmitter***. As such, each QKD station ***cannot*** have an optical modem that is adapted to ***send and receive*** optical synchronization signals because in Townsend '648 optical signals can only be transmitted in one direction from the transmitter to the receiver.

Further, there is no circulator shown in FIG. 4. The items 49 and 41 cited by the Examiner are the ***modulator driver*** and the ***phase modulator***, respectively, and are not related in any way to Applicants' optical modem. Further, there is no need for a circulator in Townsend '648 because the transmission of optical signals is ***one way*** from the transmitter to the receiver. The use of the circulator in Applicants' claimed invention is to accommodate the ***two-way*** transmission of optical synchronization signals.

Thus, the combination of Townsend '648 and Bennett cannot be said to teach all of the claim limitations of claim 11, so that an obvious rejection based on the combination is inappropriate.

Claims 8 and 9

Claims 8 and 9 depend from claim 1. The obvious rejection of claims 8 and 9 are based on the presumption that Townsend '648 discloses all of the claim limitations of claim 1, while Gisen discloses the limitations in claims 8 and 9.

However, for the reasons discussed above, Townsend '648 does not include all of the claim limitations of claim 1.

Consequently, the combination of Townsend '648 and Gisen cannot be said to disclose all of the claim limitations in claims 8 and 9 so that an obvious rejection

based on the combination is inappropriate.

Claims 16 and 18

Claims 16 and 18 depend from claim 13.

The obvious rejection of claims 16 and 18 are based on the presumption that Townsend '648 discloses all of the claim limitations of claim 13, while either Mody or "official notice" discloses the limitations in claims 16 and 18.

However, for the reasons discussed above, Townsend '648 does not include all of the claim limitations of claim 13.

Consequently, the combination of Townsend '648 and Mody (or the use of "official notice") cannot be said to disclose all of the claim limitations in claims 16 and 18, so that an obvious rejection based on the combination is inappropriate.

In view of the above, withdrawal of the obvious rejections of claims 3-9, 11, 16 and 18 is earnestly requested.

CONCLUSION

Applicants respectfully submit that claims 1-20 as presently presented are in condition for allowance. As such, Applicants respectfully request withdrawal of the anticipation rejection of claims 1, 2 10, 12-15 and 17, withdrawal of the obviousness rejection of claims 3-9, 11, 16 and 18, and the issuance of a Notice of Allowance in due course for the pending claims 1-20.

The Examiner is encouraged to contact the Assignee's authorized representative at 941-378-2744 to discuss any questions that may arise in connection with this Amendment.

Respectfully Submitted,

By: _____ Date: November 19, 2008

Joseph E. Gortych

Reg. No. 41,791

Customer No. 53590

Opticus IP Law PLLC
7791 Alister Mackenzie Dr
Sarasota, FL 34240 USA

Phone: 941-378-2744
Fax: 321-256-5100
E-mail: jg@opticus-ip.com